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## (54) INK JET RECORDING SHEET

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide an ink jet recording sheet which shows high gloss, high print density, excellent ink absorption, satisfactory color reproducibility and also superb image reproducibility.

**SOLUTION:** An ink receiving layer is formed on a support, and a gloss development layer consisting of a coated composition composed mainly of an a spherical colloidal silica, is applied onto the surface of the ink receiving layer. Further, these layers are pressed into contact with a mirror surface roll heated while the gloss development layer is wet and then are dried. Especially the particle shape of the a spherical colloidal silica is like a pearl necklace. The particle dia. of the pearl necklace-like colloidal silica is 30 nm or more and 800 nm or less, preferably 80 nm more and 500 nm or less due to the binding of the plurality of a spherical primary particle with 5 nm or more and 100 nm or less, preferably 8 nm or more and 60 nm or less particle dia.

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## CLAIMS

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[Claim(s)]

[Claim 1] The ink jet record sheet characterized by consisting of an application constituent with which the laminating of the gloss manifestation layer is carried out one by one on a base material on at least one or more-layer ink acceptance layer and this ink acceptance layer, a pressure welding is carried out to the mirror plane roll heated while this gloss manifestation layer was in the damp or wet condition, it comes to carry out specular-gloss finishing, and this gloss manifestation layer contains un-spherical colloidal silica.

[Claim 2] The ink jet record sheet according to claim 1 characterized by the particle shape of this un-spherical colloidal silica being a pearl necklace-like.

[Claim 3] The ink jet record sheet according to claim 2 with which this pearl necklace-like colloidal silica is characterized by for two or more with a 5nm or more particle diameter [ 100nm or less ] spherical primary particles joining together, and having 30nm or more particle diameter of 800nm or less.

[Claim 4] The ink jet record sheet according to claim 2 with which this pearl necklace-like colloidal silica is characterized by for two or more with a 8nm or more particle diameter [ 60nm or less ] spherical primary particles joining together, and having 80nm or more particle diameter of 500nm or less.

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] While this invention has the glossiness which is equal to commercial cast coated paper especially about the ink jet record sheet which records using water color ink, and its manufacture approach, it relates to an ink jet record sheet with high good ink absorptivity and printing concentration.

[0002]

[Description of the Prior Art] Although an ink jet recording method makes the minute drop of ink fly by various working principles, and is made to adhere to record sheets, such as paper, and an image, an alphabetic character, etc. are recorded, development and fixing with the large versatility of a high speed, the low noise, ease [ multiple-color-izing ], and a record pattern have the descriptions, such as needlessness, and have spread quickly in various applications as recording devices, such as various graphic forms and a color picture, including the kanji. Furthermore, the image formed by the multicolor ink jet method can acquire the record which is equal as compared with the print by process

printing by the platemaking method, or the color photography method, and for the application with which there is few creation number of copies and it can be managed, since it is cheap rather than it is based on a photograph technique, it is being widely applied even to the full color image recording field.

[0003] When the concentration of a printing dot being high as a record sheet used by this ink jet recording method, and a color tone's being brightly skillful and absorption of ink are early and a printing dot laps, ink flows out or it spreads, or the diffusion to the longitudinal direction of not carrying out and a printing dot is not large beyond the need, and it is required that the circumference should be smooth and should not fade etc.

[0004] In order to solve these problems, some proposals have been made from before. For example, the ink jet record form which comes to carry out humidity of the coating for surface treatment to the stencil paper of low size is indicated by JP,52-53012,A.

Moreover, the ink jet record form which prepared the coated layer of ink absorptivity in the support surface is indicated by JP,55-5830,A, and the example of the smear paper using the two-layer structure where ink rate of absorption differs [ the example using non-colloid silica powder ] in JP,55-11829,A further as a pigment in an enveloping layer is indicated by JP,55-51583,A and the 56-157 official report at it.

[0005] Generally, the ink acceptance layer with ink absorptivity needs to have many openings in an ink acceptance layer, in order to absorb and hold ink. However, since light stops easily being able to reach the ink in which the ink acceptance layer with many openings became opaque, and permeated the opening since the incident light to an ink acceptance layer will be scattered about or transparency was barred, an image becomes whitish, and color reproduction nature and the depth of shade fall. Moreover, the ink acceptance layer with many openings is difficult for desiring high gloss from becoming a porosity front face.

[0006] As an ink jet record sheet which has high gloss, a porosity ink acceptance layer is formed on a transparent base material at JP,61-197285,A, for example, The method of observing the image formed in the ink acceptance layer from a base material side is proposed. The laminating of the color adsorption layer which consists of porous hydrated alumina on a transparent base material, and the solvent absorption layer which consists of porous pulverizing silica is carried out one by one, and the method of observing the image formed at the color adsorption layer from a base material side is proposed by JP,3-215081,A.

[0007] However, in case an image is printed, it will be necessary to carry out an image processing so that it may become a mirror image, and by these approaches, the base material to be used will be further limited to what has transparency.

[0008] Moreover, after processing in the water solution containing a cationic polyelectrolyte, colloidal silica is used for the approach and JP,2-274587,A which carry out the cast for the improvement in gloss, and after processing in the water solution containing a cationic polyelectrolyte, the proposal of an approach which carries out the cast is made by JP,2-113986,A. However, when it prints, in order that the cationic polyelectrolyte which exists in a front face may remelt in ink, surface roughening of the shape of surface type of a printing part is carried out, and the fall of the gloss of a printing part or the clear nature of an image becomes easy to produce use of a cationic polyelectrolyte.

[0009] Although there are the recording paper, a film, etc. which applied the resin which

absorbs ink by the dissolution and swelling in order to give gloss, the thing which is going to make it absorb ink by the dissolution and swelling of such resin has absorption of ink, and slow desiccation, although gloss is acquired, and generating of the dirt by ink imprint or a blot poses a problem.

[0010] The processing which gives gloss has a common method of graduating a coated layer front face by \*\*\*\*(ing) between the rolls to which a pressure and temperature were applied using calender equipments, such as a supercalender and gloss calender. However, although gloss will improve if calender processing is performed under a high linear pressure in order to give gloss to an ink jet record sheet, there is a problem which the openings of a coated layer decrease in number, and absorption of ink becomes slow, and overflow of ink generates from lack of absorption capacity. within the limits of the ink absorption capacity by which calender processing is permitted from this -- conditions -- not choosing -- in order not to obtain but to acquire absorption and the gloss of ink, correspondence with the present technique is difficult for the present condition.

[0011] Furthermore, although good sharp nature and color nature are obtained on personal computer level and an ink jet recording method can also obtain a complicated image quickly comparatively simple, the conventional ink jet record sheet is deficient in the feeling of gloss of a sheet as compared with a print sheet or printing paper, and application in the field expected feeling of gloss, such as a poster and a sticker, has been made difficult from the point of a feeling of gloss. However, the relation with which ink absorptivity and gloss disagree is overthrown, and the demand of a record medium which can use the simple nature of an ink jet recording method is large.

[0012] The ink jet record sheet which prepared the layer which consists of a colloidal particle, a latex, a water-soluble polymer, etc. by the cast coating method as an ink jet record sheet with which are satisfied of such a demand is shown. However, the voidage of a coating layer was surely low and the combination of the material used conventionally of ink absorptivity was inadequate. Moreover, in order to improve this, when it was going to gather voidage, it was in the condition that the reinforcement of a coat becomes inadequate and practical use cannot be borne.

[0013]

[Problem(s) to be Solved by the Invention] In printing by water color ink, the purpose of this invention has high ink absorptivity, printing concentration, and gloss, and is to acquire the ink jet record sheet excellent in color reproduction nature and image repeatability, the ink jet record sheet for full color record with which the feeling of gloss of the cast-coated-paper level of marketing especially applied to offset printing, the tag, or the label application is demanded, and its manufacture approach.

[0014]

[Means for Solving the Problem] About the ink jet record sheet, this invention person etc. found out the ink jet record sheet with which the purpose of this invention results in completion, and its manufacture approach, as a result of repeating examination wholeheartedly.

[0015] That is, it is characterized by the 1st ink jet record sheet in this invention consisting of an application constituent with which the laminating of the gloss manifestation layer is carried out one by one on a base material on at least one or more-layer ink acceptance layer and this ink acceptance layer, a pressure welding is carried out to the mirror plane roll heated while this gloss manifestation layer was in the damp or wet

condition, it comes to carry out specular-gloss finishing, and this gloss manifestation layer contains un-spherical colloidal silica.

[0016] Especially as this un-spherical colloidal silica, a pearl necklace-like thing has desirable particle shape.

[0017] Moreover, as this pearl necklace-like colloidal silica, two or more spherical particles [ 60nm or less ] 8nm or more join together, and have 80nm or more pearl necklace-like configuration of 500nm or less still more preferably 30nm or more 800nm or less particle diameter still more preferably 5nm or more 100nm or less particle diameter.

[0018]

[Embodiment of the Invention] Below, the ink jet record sheet and its manufacture approach of this invention are explained at a detail.

[0019] The approach of generally painting the coated layer which used the porous pigment as the principal component in a coat type ink jet record sheet is taken. However, about [ that the gloss corresponding to the purpose of this invention is not acquired even if particle diameter is large it is difficult to produce a feeling of gloss sensuously, it performs calender processing on an elevated temperature and high linear pressure conditions and it aims at improvement in smooth nature, since it exists as secondary particle / 3rd ], and openings will decrease in number, ink absorptivity will fall, and this pigment will lose the description of an ink jet record sheet.

[0020] However, as this invention shows, the printing side of this record sheet uses a specific material. The ink acceptance layer which adjoins the gloss manifestation layer which has the function to make most ink penetrate, and this gloss manifestation layer that has ink absorptivity, and is prepared between base materials is constituted. While it has the gloss of commercial cast coated paper by obtaining this gloss manifestation layer using the approach (it abbreviating to cast processing hereafter) of carrying out a pressure welding to a mirror plane roll, and carrying out specular-gloss finishing while this layer has a damp or wet condition, it becomes possible to make the ink absorptivity which is an opposite property balance.

[0021] When water color ink is given to a recording surface, this ink penetrates a gloss manifestation layer and makes the ink acceptance layer which adjoins a gloss manifestation layer absorb this ink promptly in the ink jet record sheet of this invention. That is, in a gloss manifestation layer, the purpose of this invention is reached by giving the function of ink absorptivity and color fixable, in an ink acceptance layer for the function to make most of high gloss and ink penetrate, and carrying out functional separation of the coated layer.

[0022] Although cast processing imprints the surface state of a mirror plane roll and the specular gloss is given to a coated layer front face, with the same presentation as the cast coated paper of marketing which used pigments, such as a kaolin and a calcium carbonate, as the principal component, it turned out that the target glossiness is not obtained for this invention with the application constituent which a problem is in the color nature and sharp nature which determine image quality, and uses a porous pigment as a principal component. Although it was possible to obtain the application constituent which used the colloidal particle and the porous pigment together by cast processing since glossiness improves by making particle diameter small, the glossiness made into the purpose even in this case was low, in order to raise glossiness, when this colloidal

particle is increased, the fall of ink absorptivity will arise, and this invention was not able to solve the purpose.

[0023] The gloss manifestation layer concerning this invention consists of an application constituent which uses un-spherical colloidal silica and a binder as a principal component.

[0024] It is the description that the colloidal silica which constitutes the gloss manifestation layer concerning this invention is un-spherical. The un-spherical colloidal silica concerning this invention points out the long and slender configuration which the primary particle connected in the shape of a chain, the thing which has the three-dimensional network, or a pearl necklace-like thing to generally the particle shape of colloidal silica carrying out the near configuration spherically or spherically.

[0025] Especially as a silica particle which constitutes the gloss manifestation layer concerning this invention, a pearl necklace-like thing is desirable. A spherical primary particle connects two or more pearl necklace-like colloidal silica concerning this invention, and it points out what has the configuration which resembled the pearl necklace literally.

[0026] Although each of above-mentioned chain-like particles and pearl necklace-like particles is long and slender configurations which have branching, the difference among both is in the abundance of a spherical part. The pearl necklace-like particle concerning this invention means that with which the circle-like graphic form resulting from a spherical part has 70% or more of roundness, the sum total area of the inscribed circle of each circle-like graphic form occupies 70% or more of pearl necklace-like particle all projected area, and the inscribed circle of each circle-like graphic form does not lap mutually in the secondary subject copy by the electron microscope. Here, it is expressed with the ratio of the radius of the inscribed circle to the radius of the circumscribed circle of the target graphic form profile roundness, and becomes 100% in a perfect circle.

[0027] By using these un-spherical colloidal silica, a gloss manifestation layer with more high voidage is obtained, and ink absorptivity improves remarkably.

[0028] About the pearl necklace-like colloidal silica concerning this invention, if particle size is small, voidage will become low, and the size of the opening which particle size produces among large grain children becomes large, and there is an inclination for coloring of ink to get worse. Therefore, 30nm or more 800nm or less of 80nm or more things 500nm or less is used still more preferably preferably. 100nm or more thing 200nm or less is good also especially in it.

[0029] Also about the spherical primary particle of the pearl necklace-like colloidal silica concerning this invention, if particle size is small, voidage will become low, and the size of the opening which particle size produces among large grain children becomes large, and there is an inclination for coloring of ink to get worse. Therefore, 5nm or more 100nm or less of 8nm or more things 60nm or less is used still more preferably preferably. 18nm or more thing 40nm or less is good also especially in it.

[0030] These un-spherical colloidal silica concerning this invention is obtained by various approaches, and no matter it may be obtained by what approach in this invention, if the silica particle has the shape of a non-ball, it can be used for this invention.

[0031] Moreover, the un-spherical colloidal silica marketed can also be used suitably. As an example, the Snow tex UP series made from the Nissan chemistry (an acid type, a cation denaturation type, etc. are included) or this Snow tex PS series (an acid type, a

cation denaturation type, etc. are included) is mentioned.

[0032] Moreover, although it is based also on the particle diameter of this pigment since particle diameter is large and opacity generally produces this pigment, although the gloss manifestation layer of this invention can be used together with un-spherical colloidal silica and one or more kinds of well-known white pigments can be used, the weight ratio of this un-spherical colloidal silica / this pigment is 90/10 or more more preferably 80/20 or more.

[0033] As a binder, moreover, starch derivative; carboxymethyl celluloses, such as oxidization starch, etherification starch, and phosphoric ester-ized starch, Cellulosics, such as hydroxyethyl cellulose; Casein, gelatin, Soybean protein, polyvinyl alcohol, or its derivative; A polyvinyl pyrrolidone, Maleic-anhydride resin, a styrene-butadiene copolymer, conjugated diene system copolymer latexes [, such as a methyl methacrylate-butadiene copolymer, ]; -- acrylic polymer latexes [, such as acrylic polymers, such as a polymer of acrylic ester and methacrylic ester, or a copolymer, ]; -- vinyl system polymer latexes [, such as an ethylene-vinyl acetate copolymer, ]; -- \*\* The functional-group denaturation polymer latex by functional-group content monomers, such as a carboxy group of \*\*\*\*\* various polymers; Melamine resin, aqueosity adhesives [, such as heat-curing synthetic resin, such as a urea-resin, ]; -- acrylic ester [, such as polymethylmethacrylate, ]; -- the polymer of methacrylic ester, or copolymer-resin; -- polyurethane resin -- Synthetic-resin system adhesives, such as an unsaturated polyester resin, a vinyl chloride-vinyl acetate copolymer, a polyvinyl butyral, and an alkyd resin, etc. can be mentioned. as the loadings of a binder -- the silica solid content 100 weight section -- receiving -- 5 - 70 weight section -- preferably, under in 5 weight sections, it is 5 - 50 weight section, and the coated layer reinforcement of a gloss manifestation layer runs short, and if 70 weight sections are exceeded, ink absorptivity will fall.

[0034] Furthermore, a color fixing agent, pigment agent, thickener, fluid amelioration agent, defoaming agent, foam suppressor, release agent, foaming agent, penetrating agent, coloring color, color pigment, fluorescent brightener, ultraviolet ray absorbent, anti-oxidant, antiseptics, \*\* motorcycle agent, deck-watertight-luminaire-ized agent, humid paper reinforcing agent, and desiccation paper reinforcing agent etc. can also be suitably blended with a gloss manifestation layer as an additive.

[0035] Various equipments, such as various blade coaters, a roll coater, an air knife coater, bar coater, rod blade coater, curtain coater, short dwell coater, and size press, can be used for the approach of painting a gloss manifestation layer. What is necessary is just to be two or more 2 g/m, although it changes as an amount of painting of a gloss manifestation layer with the approach of cast processing, the smooth nature of an ink acceptance layer and size nature, and gloss demanded. Moreover, it is also possible to spray humidification air and a humidification steam on the rear face of the gloss manifestation layer which sandwiched the base material, and to carry out curl correction after cast processing, and calender equipments, such as a machine calender, TG calender, a super calender, and a software calender, may be used further.

[0036] After carrying out coating of the ink acceptance layer and drying, while there are a direct method, the solidifying method, and a re-humidity method (rewet system) in cast processing, the application constituent which constitutes a gloss manifestation layer is painted and this painting side is in a damp or wet condition, it is the approach of it being contacted and stuck by pressure, drying the mirror plane roll which heated this painting

side, exfoliating, and making the replica of this mirror plane roll surface forming in this painting side. A direct method is the approach of carrying out a pressure welding to the mirror plane roll heated in the state of un-drying (damp or wet condition), and drying after painting this gloss manifestation layer, and the solidifying method is the approach of carrying out the pressure welding of the application constituent of this gloss manifestation layer to the mirror plane roll which was made to solidify this constituent with an acid solution, an alkali solution, etc., and was heated. In addition, the thermocoagulation which infrared radiation is irradiated [ thermocoagulation ] at this constituent and makes a front face solidify is also contained in the solidifying method. A re-humidity method is the approach of making carry out re-humidity of this ink transparency layer with the liquid with which this ink transparency layer is made into the painting desiccation back, and it makes water a subject, carrying out a pressure welding to the heated mirror plane, and drying.

[0037] Although each of these cast arts can be used for the ink jet record sheet of this invention, in order to obtain an ink jet record sheet with high glossiness especially, its direct method is desirable. Moreover, the surface roughness of this mirror plane roll, skin temperature, a diameter, the pressure at the time of a pressure welding (linear pressure), a coating rate, etc. can be suitably chosen like the manufacture conditions of commercial cast coated paper.

[0038] The ink jet record sheet concerning this invention may not stop at the use as an ink jet record sheet, but may be used as what kind of record sheet which uses liquefied ink at the time of record. The thermofusion nature ink which uses the thermofusion nature matter, dyes and pigments, etc. as a principal component For example, a resin film, The ink sheet applied on thin base materials, such as high density paper and a synthetic paper, is heated from the rear face. Heating fusion of the television sheet for thermal transfer recording and thermofusion nature ink which are made to carry out melting of the ink and imprint it is carried out. The formation of a minute drop, The television sheet corresponding to the sensitization pressure-sensitive mold donor sheet using the microcapsule which connoted the ink jet record sheet which carries out flight record, the ink JIETO record sheet using the ink which dissolved the oil color in the solvent, a photopolymerization mold monomer, and colorless or colored dyes and pigments etc. is mentioned.

[0039] The common feature of these record sheets is a point that ink is in a liquid condition at the time of record. liquefied ink -- by hardening, solidification, or fixing -- the depth direction of the ink acceptance layer of a record sheet -- or -- horizontal -- receiving -- osmosis -- or it spreads. The various record sheets mentioned above need the absorptivity according to each method, and even if it uses as various kinds of record sheets which mentioned above the ink jet record sheet of this invention, they are not cared about at all.

[0040] Furthermore, it is also possible to consider as the record sheet which carries out heating fixing of the toner of the electrophotography recording method currently widely used for the copying machine, the printer, etc., to use the ink jet record sheet in this invention, to prepare a binder layer, and to use it for a label application.

[0041] It excels in ink absorptivity, printing concentration is high, and the ink jet record sheet which has the glossiness of commercial cast-coated-paper level becomes possible [ obtaining by considering as the two-layer structure which consists of a gloss



manifestation layer and an ink acceptance layer ], as shown in the following examples. In the ink jet record sheet of this invention, it has the function which a gloss manifestation layer excels [ function ] in transparency and most printed ink moves to an ink acceptance layer promptly, and the target glossiness can also be obtained from preparing this gloss manifestation layer by cast processing to coincidence.

[0042] The ink acceptance layer concerning this invention consists of application constituents which use a pigment and a binder as a principal component. As a pigment, one or more sorts of well-known white pigments can be used. For example, precipitated calcium carbonate, whiting, a magnesium carbonate, A kaolin, talc, a calcium sulfate, a barium sulfate, a titanium dioxide, A zinc oxide, zinc sulfide, zinc carbonate, a satin white, aluminum silicate, The diatom earth, a calcium silicate, a magnesium silicate, synthetic amorphous silica, Colloidal silica, an alumina, a colloidal alumina, pseudo-boehmite, White inorganic pigments, such as an aluminum hydroxide, a lithopone, a zeolite, hydrated halloysite, and a magnesium hydroxide, Organic pigments, such as a styrene system plastics pigment, an acrylic plastics pigment, polyethylene, a microcapsule, a urea-resin, and melamine resin, etc. are mentioned.

[0043] As a binder, moreover, starch derivative; carboxymethyl celluloses, such as oxidization starch, etherification starch, and phosphoric ester-ized starch, Cellulosics, such as hydroxyethyl cellulose; Casein, gelatin, Soybean protein, polyvinyl alcohol, or its derivative; A polyvinyl pyrrolidone, Maleic-anhydride resin, a styrene-butadiene copolymer, conjugated diene system copolymer latexes [ , such as a methyl methacrylate-butadiene copolymer, ]; -- acrylic polymer latexes [ , such as acrylic polymers, such as a polymer of acrylic ester and methacrylic ester, or a copolymer, ]; -- vinyl system polymer latexes [ , such as an ethylene-vinyl acetate copolymer, ]; -- \*\* The functional-group denaturation polymer latex by functional-group content monomers, such as a carboxy group of \*\*\*\*\* various polymers; Melamine resin, aqueous adhesives [ , such as heat-curing synthetic resin, such as a urea-resin, ]; -- acrylic ester [ , such as polymethylmethacrylate, ]; -- the polymer of methacrylic ester, or copolymer-resin; -- polyurethane resin -- Synthetic-resin system adhesives, such as an unsaturated polyester resin, a vinyl chloride-vinyl acetate copolymer, a polyvinyl butyral, and an alkyd resin, etc. can be mentioned. as the loadings of a binder -- the pigment 100 weight section -- receiving -- 3 - 70 weight section -- preferably, under in 3 weight sections, it is 5 - 50 weight section, and the coated layer reinforcement of an ink acceptance layer runs short, and if 70 weight sections are exceeded, ink absorptivity will fall.

[0044] Furthermore, a color fixing agent, pigment agent, thickener, fluid amelioration agent, defoaming agent, foam suppressor, release agent, foaming agent, penetrating agent, coloring color, color pigment, fluorescent brightener, ultraviolet ray absorbent, anti-oxidant, antiseptics, \*\* motorcycle agent, deck-watertight-luminaire-ized agent, humid paper reinforcing agent, and desiccation paper reinforcing agent etc. can also be suitably blended with an ink acceptance layer as an additive.

[0045] Since a color will be captured in an ink acceptance layer, and the flow broth and blot broth of ink by dropping and moisture absorption of water are controlled by improvement in color nature, or formation of an insoluble salt, it is [ be / it / if / the cationic color fixing agent which consists of the secondary amine which forms especially the sulfonic group in the water-soluble direct dye which is a part for the color of water color ink, or water-soluble acid dye, a carboxyl group the amino group, etc. and an

insoluble salt, tertiary amine, and quarternary ammonium salt is blended, ] desirable.

[0046] Although it changes with classes of the gloss demanded, ink absorptivity, and base material etc. as an amount of coating of an ink acceptance layer, they are two or more 1 g/m. Moreover, gloss of an ink acceptance layer improves rather than it is also possible to divide and paint a certain fixed amount of coating on 2 times and it paints this amount of coating at a time.

[0047] Various equipments, such as various blade coaters, a roll coater, an air knife coater, bar coater, rod blade coater, curtain coater, short dwell coater, and size press, can be used for the approach of painting an ink acceptance layer by the on-machine or the off-machine. Moreover, it is also possible to use calender equipments, such as a machine calender, TG calender, a super calender, and a software calender, and to carry out flattening finishing after painting.

[0048] As a base material used by this invention, chemical pulp, such as LBKP and NBKP, Wood pulp, such as recycled pulp, such as mechanical pulp, such as GP, PGW, RMP, TMP, CTMP, and CMP, corrosion gage point, and DIP, and a conventionally well-known pigment are used as a principal component. A binder and a sizing compound and a fixing agent, a yield improver, a cation-ized agent, One or more sorts are mixed using various additives, such as a paper reinforcing agent. A Fortlinear paper machine, a cylinder machine, Coated paper, such as stencil paper manufactured with various equipments, such as a twin-wired paper machine, stencil paper which prepared size press and the anchor coat layer in starch, polyvinyl alcohol, etc., and the art paper and coat paper which prepared the coat layer on them, cast coated paper, is also further contained in stencil paper. The coated layer which starts this invention as it is may be prepared in such stencil paper and coated paper, and calender equipments, such as a machine calender, TG calender, and a software calender, may be used for them in order to control flattening. Moreover, as a basis weight of this base material, although it is usually 40 - 300 g/m<sup>2</sup>, it is not restricted especially.

[0049] Moreover, although the infiltration or the permeability of a base material is required in order to move the steam generated in case cast processing of the gloss manifestation layer is carried out to a rear face and to dry a gloss manifestation layer, and stencil paper is generally used since it is the important factor which determines the mold-release characteristic of the gloss manifestation layer from a mirror plane drum As long as it has infiltration or permeability, after fibrosing synthetic resin, such as polyethylene, polypropylene, polyester, rayon, and polyurethane, what was formed in the shape of a sheet may be used.

[0050]

[Example] Although an example is given to below and this invention is explained to it, this invention is not limited to these examples. Moreover, especially the "section" and "%" shown in an example, unless it shows clearly, oven-dry-weight section and oven-dry-weight % is shown.

[0051] The ratio of precipitated calcium carbonate / whiting / talc milled the pigment 25 section of 10/10/10, the commercial alkyl ketene dimer 0.10 section, the commercial cation system (meta) acrylamide 0.03 section, the commercial cation-ized starch 0.80 section, and the sulfuric-acid band 0.40 section by basis-weight 90 g/m<sup>2</sup> after preparation using the Fortlinear paper machine to the wood pulp 100 section which a <production of base material> base material becomes from the LBKP(freshness 400mlcsf)80 section and

the NBKP(freshness 450mlcsf)20 section.

[0052] The <coating of ink acceptance layer> ink acceptance layer was painted on the support surface. The application constituent of an ink acceptance layer prepared these as 15% of solid content concentration using the synthetic amorphous silica (fine seal X37B: Tokuyama Make) 100 section, the polyvinyl alcohol (PVA117: Kuraray Co., Ltd. make) 30 section, the colloidal silica (Snow tex-O: Nissan Chemical Industries, Ltd. make) 30 section, and the cationic color fixing agent (violet gap gin 1001 : Sumitomo Chemical Co., Ltd. make) 20 section. By the air knife coater, coating and desiccation of this coating liquid were done at the base material so that it might be set to the amount of desiccation coating of 8g/m<sup>2</sup>.

[0053] After painting on the front face of an ink acceptance layer, the <coating of gloss manifestation layer> gloss manifestation layer carried out cast processing, and was obtained. Cast processing was processed according to the dried direct method which carries out coating of the application constituent of a gloss manifestation layer to the front face of an ink acceptance layer, and carries out a pressure welding to the mirror plane roll heated by the skin temperature of 90 degrees C after 2 seconds.

[0054] Using the example 1 pearl necklace-like colloidal silica (particle-diameter [ Snow tex PS-M, / of 100-200nm ] 18-23nm of diameters of spherical primary particle: Nissan Chemical Industries, Ltd. make) 100 section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 1 was obtained.

[0055] Using the example 2 pearl necklace-like colloidal silica (particle-diameter [ Snow tex PS-L, / of 100-200nm ] 35-40nm of diameters of spherical primary particle: Nissan Chemical Industries, Ltd. make) 100 section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 2 was obtained.

[0056] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex S, particle diameter of 8-11nm) of example 3 marketing, and it considered as 5 % of the weight of SiO<sub>2</sub> concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 8.0 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO<sub>2</sub> concentration with the ultrafiltration equipment, and the silica sol was obtained. When the obtained colloidal silica was observed with the electron microscope photograph, the configuration of the shape of a pearl necklace which is 100-200nm which the spherical particle with a particle size of 8-11nm combined was carried out.

[0057] In this way, using the pearl necklace-like colloidal silica 100 obtained section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan

Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 3 was obtained.

[0058] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex XL, particle diameter of 40-60nm) of example 4 marketing, and it considered as 5 % of the weight of SiO<sub>2</sub> concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 2.0 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO<sub>2</sub> concentration with the ultrafiltration equipment, and the silica sol was obtained. When the obtained colloidal silica was observed with the electron microscope photograph, the configuration of the shape of a pearl necklace which is 100-200nm which the spherical particle with a particle size of 40-60nm combined was carried out.

[0059] In this way, using the pearl necklace-like colloidal silica 100 obtained section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 4 was obtained.

[0060] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex 50, particle diameter of 20-30nm) of example 5 marketing, and it considered as 5 % of the weight of SiO<sub>2</sub> concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 10.0 weight section in this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO<sub>2</sub> concentration with the ultrafiltration equipment, and the silica sol was obtained. When the obtained colloidal silica was observed with the electron microscope photograph, the configuration of the shape of a pearl necklace which is 200-400nm which the spherical particle with a particle size of 20-30nm combined was carried out.

[0061] In this way, using the pearl necklace-like colloidal silica 100 obtained section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 5 was obtained.

[0062] Water was added to the spherical colloidal silica (the product made from the Nissan chemistry, the Snow tex 50, particle diameter of 20-30nm) of example 6 marketing, and it considered as 5 % of the weight of SiO<sub>2</sub> concentration. It added under stirring of 10% of the weight of the calcium chloride water-solution 0.5 weight section in

this silica sol 2000 weight section, and 130 degrees C was heated under stirring for 6 hours. This was condensed up to 20.0 % of the weight of SiO<sub>2</sub> concentration with the ultrafiltration equipment, and the silica sol was obtained. When the obtained colloidal silica was observed with the electron microscope photograph, the configuration of the shape of a pearl necklace which is 40-100nm which the spherical particle with a particle size of 20-30nm combined was carried out.

[0063] In this way, using the pearl necklace-like colloidal silica 100 obtained section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 6 was obtained.

[0064] Using the example 7 un-spherical colloidal silica (particle-diameter [ the Snow tex UP, / of 40-100nm ] configuration of shape of chain of 10-20nm of sizes: Nissan Chemical Industries, Ltd. make) 100 section, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of an example 7 was obtained.

[0065] Using the spherical colloidal silica (Snow tex 20: Nissan Chemical Industries, Ltd. make) 100 section with example of comparison 1 particle diameter of 10-20nm, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of the example 1 of a comparison was obtained.

[0066] Using the spherical colloidal silica (Snow tex 20L: Nissan Chemical Industries, Ltd. make) 100 section with example of comparison 2 particle diameter of 40-50nm, the styrene butadiene system latex (0693; mean-particle-diameter [ of 135nm ]:Japan Synthetic Rubber Co., Ltd. make) 30 section, and the oleic acid potassium 2 commercial section, gloss manifestation layer coating liquid was prepared so that it might become 25% of solid content concentration. By the roll coater, this coating liquid was prepared in the ink acceptance stratification plane with the above-mentioned cast approach so that it might become amount of desiccation coating 5 g/m<sup>2</sup>, and the ink jet record sheet of the example 2 of a comparison was obtained.

[0067] The evaluation approach shown below estimated the ink jet record sheet produced in each example and the example of a comparison. Measurement and evaluation are JIS. It carried out under the environment specified to P8111.

[0068] The specular gloss of the front face of the gloss manifestation layer by which <glossiness> cast processing was carried out was measured. This glossiness is JIS.

According to Z8741, it measured with the Nippon Denshoku Industries deflection glossmeter (VGS-1001DP) as 75 degrees whenever [ close angle-of-reflection ].  
[0069] Using the <ink absorptivity> ink jet printer (BJC-420J: Canon, Inc. make), the rectangle pattern of color overlapping was printed in cyanogen ink and Magenta ink, and viewing estimated the boundary parts of this pattern and the blank paper section in accordance with the following criteria. As good ink absorptivity, A or B evaluation is required.

A: A blot is not looked at by the boundary part.

B: A blot slight into a boundary part is seen.

C: A blot is looked at by all the boundary parts.

[0070] <Printing concentration> Using the above-mentioned ink jet printer, the solid pattern was printed in black ink and the optical reflection density of a printing part was measured with Macbeth RD-918 mold. As printing concentration, if there are 1.25 or more, an image with color nature will be obtained.

[0071]

[Table 1]

[0072] It turns out that the examples 1-7 which have the gloss manifestation layer which used un-spherical colloidal silica as the principal component are excellent in ink absorptivity compared with the examples 1 and 2 of a comparison which used spherical colloidal silica as the principal component so that clearly from the above-mentioned table 1. Especially the examples 1-6 that used pearl necklace-like colloidal silica as the principal component were excellent in ink absorptivity. Examples 1 and 2 were good in glossiness, ink absorptivity, and all printing concentration also especially in it.

[0073]

[Effect of the Invention] According to this invention, by carrying out the laminating of an ink acceptance layer and the gloss manifestation layer one by one on a base material, using un-spherical colloidal silica for the application constituent of a gloss manifestation layer, and carrying out cast processing of this gloss manifestation layer further, it has high gloss and the high ink jet record sheet of printing concentration and ink absorptivity is obtained.